## AMENDMENTS TO THE CLAIMS:

The following claims will replace all prior versions of the claims in this application (in the unlikely event that no claims follow herein, the previously pending claims will remain):

1. (**Currently Amended**) An adaptive resource allocation method in a multi-channel communication system, comprising:

determining a subchannel channel gain according to channel quality; and

determining a modulation method for each subchannel based on the channel gain,

wherein the determining of the modulation method includes:

allocating a number of bits to be transmitted to a subchannel according to the channel gain;

determining an optimal number of bits to obtain minimum power for a total transmission rate according to the determined optimum number of bits; and

allocating a final number of bits to be transmitted for the subchannel according to the optimal number of bits~~a) allocating a number of bits to be transmitted according to a subchannel quality;~~

~~b) determining a minimum power for a total transmission rate;~~

~~c) determining a channel gain for the subchannel according to the allocated number of bits and the power; and~~

~~d) determining a modulation method for each subchannel based on the channel gain~~.

2. (**Currently Amended**) The adaptive resource allocation method of claim 1, wherein, ~~in a),~~ a Lagrange multiplier λ is analytically and experimentally estimated to ~~allocate the number of bits~~determine the optimal number of bits.

3. (**Currently Amended**) The adaptive resource allocation method of claim 1, wherein determining the optimal number of bits includes a recursive convex search according to an average power and an object transmission rate $R_t$, and determining the final number of bits based on a result of the search~~further comprising:~~

~~in d);~~

~~adaptively performing a convex search in the recursive manner according to the average power and transmission rate; and~~

~~determining a final modulation method of the subchannels based on the searched convex~~.

4. (**Currently Amended**) The adaptive resource allocation method of claim 3, wherein a relation between the average power and the object transmission rate $R_t$ is represented as $P(R)=\sigma^2\alpha^{-R}$ and $R>0$ with reference to a given channel response and a modulator, where P(R) denotes an average power-transmission rate function, $\sigma^2$ denotes a variance of radio wave signals, and $\alpha$ is greater than 1.

5. (**Currently Amended**) The adaptive resource allocation method of claim 3, wherein the convex search process for searching an optimal solution $\lambda^*$ for the ~~given~~ object transmission rate $R_t$ comprises:

a) respectively initializing a supremum $\lambda_l$ and an infimum $\lambda_u$ of the object transmission rate $R_t$ to be 0 and $\infty$;

b) experimentally selecting an initial Lagrange multiplier estimate of $\lambda$ for the object transmission rate $R_t$;

c) solving a transmission rate non-constraint problem until a Lagrange multiplier $\lambda$ corresponding to the object transmission rate $R_t$ is found;

d) searching for a lowest transmission rate $R_l$ and a highest transmission rate $R_h$; and

e) returning to solving the transmission rate non-constraint problem.

6. (**Currently Amended**) The adaptive resource allocation method of claim 5, wherein the initial Lagrange Multiplier value of $\lambda$ satisfies:

$$\lambda = -\frac{\partial P(R)}{\partial R} = \alpha^{-R}\sigma^2 \ln \alpha$$

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7. (**Currently Amended**) The adaptive resource allocation method of claim 6, wherein the supremum $\lambda_l$ for the object transmission rate $R_t$ satisfies:

$$\lambda_l = \alpha^{-R(\lambda_l)}\sigma^2 \ln \alpha ,$$

the infimum $\lambda_u$ satisfies:

$$\lambda_u = \alpha^{-R(\lambda_u)}\sigma^2 \ln \alpha ,$$

and the supremum $\lambda_l$ and the infimum $\lambda_u$ satisfies:

$$\frac{\lambda_u}{\lambda_l} = \alpha^{R(\lambda_u)-R(\lambda_l)} .$$

8. (**Currently Amended**) The adaptive resource allocation method of claim 7, wherein an optimal $\lambda^*$ corresponding to the object transmission rate $R_t$ satisfies:

$$\lambda^*(R_t) = \alpha^{-R_t}\sigma^2 \ln \alpha = \lambda_l \alpha^{R(\lambda_l)-R_t}\sigma^2 \ln \alpha = \lambda_l \left(\frac{\lambda_u}{\lambda_l}\right)^{\left(\frac{R(\lambda_l)-R_t}{R(\lambda_l)-R(\lambda_u)}\right)} .$$

9. (Original) The adaptive resource allocation method of claim 7, wherein the optimal $\lambda^*$ corresponding to the object transmission rate $R_t$ satisfies:

$$\lambda^*(R_t) = \lambda_u \left(\frac{\lambda_l}{\lambda_u}\right)^{\left(\frac{R_t - R(\lambda_u)}{R(\lambda_l)-R(\lambda_u)}\right)} .$$

10. (Original) The adaptive resource allocation method of claim 5, wherein, in c) for solving the transmission rate non-constraint problem, a less Lagrange multiplier $\lambda$ is selected for the purpose of having a solution representing a higher transmission rate in a next step when a transmission rate for a predetermined solution or a highest transmission rate for a plurality of solutions is less than the object transmission rate $R_t$, which is repeatedly performed until the Lagrange multiplier $\lambda$ corresponding to the object transmission rate $R_t$ is found.

11. (Original) The adaptive resource allocation method of claim 10, wherein, in c) for solving the transmission rate non-constraint problem, a lowest transmission rate $R_t$ and a highest transmission rate $R_h$ are found when the initial estimate $\lambda$ is a singular value.

12. (Original) The adaptive resource allocation method of claim 10, wherein, in c) for solving the transmission rate non-constraint problem, one transmission rate satisfying a relation of $R_l$=$R_h$=$R(\lambda)$ is found when the initial estimate $\lambda$ is not a singular value.

13. (Original) The adaptive resource allocation method of claim 10, wherein, in d) for searching for the lowest transmission rate $R_l$ and the highest transmission rate $R_h$, the initial estimate $\lambda$ becomes the optimal value when a relation of $R_l \leq R_t \leq R_h$ (lowest transmission rate $\leq$ object transmission rate $\leq$ highest transmission rate) is given.

14. (Original) The adaptive resource allocation method of claim 10, wherein, in d) for searching for the lowest transmission rate $R_l$ and the highest transmission rate $R_h$, a transmission rate $R_H(>R_h)$ in which a power reduction rate is maximized compared to the transmission rate increase at $R_h$ and the supremum $\lambda_u$ is updated with an inclination between $R_h$ and $R_H$ when a relation of $R_h<R_t$ (highest transmission rate < object transmission rate) is given.

15. (Original) The adaptive resource allocation method of claim 14, wherein the transmission rate $R_H$ in which the power reduction rate is maximized is found by searching for available modulation methods having transmission rates greater than $R_h$.

16. (Original) The adaptive resource allocation method of claim 15, wherein the initial Lagrange multiplier estimate $\lambda$ becomes the optimal solution when a relation of $R_h \leq R_t \leq R_H$ (highest transmission rate $\leq$ object transmission rate $\leq$ transmission rate in which the power reduction rate is maximized) is given.

17. (Original) The adaptive resource allocation method of claim 16, wherein the initial Lagrange multiplier estimate $\lambda$ for a next process is estimated in an experimental manner when

the infimum is 0, and the estimate Lagrange multiplier $\lambda$ for a next process is calculated by the equation 14 or 15 when the infimum is not 0.

18. (Original) The adaptive resource allocation method of claim 10, wherein, in d) for searching for the lowest transmission rate $R_l$ and the highest transmission rate $R_h$, the transmission rate $R_L(<R_l)$ in which the power reduction rate is maximized compared to the transmission rate increase at the lowest transmission rate $R_l$ is found and the supremum $\lambda_l$ is updated with an inclination between $R_l$ and $R_L$ when a relation of $R_l>R_t$ (lowest transmission rate > object transmission rate) is given.

19. (Original) The adaptive resource allocation method of claim 18, wherein the transmission rate $R_L$ in which the power reduction is maximized is found by searching for available modulation methods having transmission rates less than $R_l$.

20. (Original) The adaptive resource allocation method of claim 19, wherein an initial Lagrange multiplier estimate $\lambda$ becomes the optimal value when a relation of $R_L \leq R_t \leq R_l$ (transmission rate in which power reduction rate is maximized $\leq$ object transmission rate $\leq$ lowest transmission rate) is given.

21. (Original) The adaptive resource allocation method of claim 20, wherein the initial Lagrange multiplier estimate $\lambda$ for a next process is estimated in an experimental way when the supremum $\lambda_u$ is $\infty$, and the estimate Lagrange multiplier $\lambda$ for a next process is calculated by the equation 14 or 15 when the supremum is not $\infty$.

22. (**Currently Amended**) An adaptive resource allocation processor in an orthogonal frequency division multiplexing system comprising:

a channel estimator for estimating a channel quality;

an adaptive subchannel allocator for determining a channel gain for a subchannel based on the estimated channel ~~value~~quality, and allocating bits and power for the subchannel based on the channel gain; and

an adaptive bit loader for outputting a bit table and a power table according to the allocated bits and power;

wherein the adaptive subchannel allocator is configured to allocate an optimal number of bits to be transmitted in the subchannel according to the channel gain, based upon a minimum power for a total transmission rate according to the number of bits.

23. (Original) The adaptive resource allocation processor of claim 22, further comprising a symbol mapper and a symbol demapper for respectively mapping and demapping bits and power of symbols according to the bit table and the power table.

24. (**New**) An adaptive resource allocation method in a multi-channel communication system, comprising:

a) allocating a number of bits to be transmitted according to a subchannel quality;

b) determining a minimum power for a total transmission rate;

c) determining a channel gain for the subchannel according to the allocated number of bits and the power; and

d) determining a modulation method for each subchannel based on the channel gain, comprising:

adaptively performing a convex search in the recursive manner according to the average power and an object transmission rate $R_t$; and

determining an initial Lagrange multiplier estimate of $\lambda$ for the object transmission rate $R_t$, wherein the initial Lagrange Multiplier value of $\lambda$ satisfies:

$$\lambda = -\frac{\partial P(R)}{\partial R} = \alpha^{-R}\sigma^2 \ln \alpha$$

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25. (**New**) An adaptive resource allocation method in a multi-channel communication system, comprising:

a) allocating a number of bits to be transmitted according to a subchannel quality;

b) determining a minimum power for a total transmission rate;

c) determining a channel gain for the subchannel according to the allocated number of bits and the power; and

d) determining a modulation method for each subchannel based on the channel gain that includes:

adaptively performing a convex search in the recursive manner according to the average power and an object transmission rate $R_t$, the convex search includes solving a transmission rate non-constraint problem until a Lagrange multiplier $\lambda$ corresponding to the object transmission rate $R_t$ is found,

wherein a less Lagrange multiplier $\lambda$ is selected for the purpose of having a solution representing a higher transmission rate in a next step when a transmission rate for a predetermined solution, or a highest transmission rate for a plurality of solutions is less than the object transmission rate $R_t$, which is repeatedly performed until the Lagrange multiplier $\lambda$ corresponding to the object transmission rate $R_t$ is found.